

REMARKS/ARGUMENTS

This amendment is being submitted in response to the Office Action dated March 16, 2005. In the Office Action, the drawings were objected to by the Examiner because a replacement drawing of figure 4 was not filed. Applicants respectfully submit that a replacement sheet for figure 4 has been filed with this response. Withdrawal of the drawing objection is respectfully solicited.

In the Office Action, claims 9 and 15 were rejected under the judicially created doctrine of double patenting over patented claims 6 and 7 of Dumoulin et al. (US Patent No. 6,584,337). Applicants respectfully submit that a terminal disclaimer under 37 C.F.R. §1.321(c) has been submitted along with the response. Withdrawal of the double patenting rejection is respectfully solicited.

In the Office Action, claims 9-15, 17-26 and 32-39 were rejected under 35 USC §103 (a) as being unpatentable over Hajnal et al. (US patent 6,385,478) in view of Pelc et al. (US Patent 6,445,181). No new matter has been added. Claims 1-6, 8 and 27-31 have been withdrawn. Claims 9-15, 17-26 and 32-39 remain pending in this application. Reconsideration in view of the above amendments and following remarks is respectfully requested.

Statement of formal election

In response to the Restriction Requirement dated September 24, 2004, Applicants hereby elect without traverse claims 9-15, 17-26 and 32-39, drawn to a method for producing an image from an extended volume of interest within a subject using a magnetic resonance imaging (MRI) system where the extended volume of interest is larger than an imaging portion of a magnet within the MRI system, classified in class 324, subclass 309.

Claims allowable over the applied art

The rejection of claims 9-15, 17-26 and 32-39 over Hajnal (US Patent 6,385,478) in view of Pelc et al. (US Patent 6,445,181) is respectfully traversed. The present invention, as claimed in previously amended independent Claims 9 and 18 are patentable over the Hajnal reference. Specifically, the present invention claims an imaging method for producing a Magnetic Resonance (MR) image of a subject. The method includes translating the volume using a positioning device along an axis of the MRI system and imaging portions of the volume when they are within the imaging portion of the magnet. The extended volume of interest is larger than an imaging portion of a magnet within the MRI system. The method further includes detecting a plurality of MR signals from at least one radio frequency (RF) coil array for a given field-of-view within the MRI system as the positioning device is translating the volume and sending the plurality of MR signals to a plurality of receivers, the receivers each being adapted to adjust a receiver parameter. The receiver parameter is adjusted based on direction of the image parallel to a motion of the subject. The receive parameter may be frequency and the phase of the receive coils. The method further includes computing a plurality of respective sub-images corresponding to the plurality MR signals for each of the plurality of receivers and for the given field-of-view (FOV) at a plurality of incremented

locations of the subject. The plurality of respective sub-images is then combined to form a composite image of the volume of interest. The combining step comprises combining a central portion of each sub-image to form the composite image.

The Hajnal reference does not teach, suggest or disclose each and every aspect of Applicants' recited in claims 9 and 18. Specifically, Hajnal does not teach, suggest or disclose a method for producing an image from an extended volume of interest within a subject, where the extended volume of interest is larger than an imaging portion of a magnet. The Hajnal reference is particularly directed to MRI system for generating images of a restricted volume (See, abstract). The restricted volume is clearly smaller than the imaging volume as shown in Figure 1. In addition, Hajnal does not teach, suggest or disclose computing sub-images corresponding to the MR signals for each receiver and for the given field-of-view (FOV) at a plurality of incremented locations of the subject. Furthermore, the Hajnal reference does not teach, suggest or disclose combining the sub-images to form a composite image of the volume of interest, the combining step including combining a central portion of each sub-image to form the composite image. The Hajnal reference merely describes that the duplicate data acquired from various scans will be averaged to improve signal to noise ratio (column 6, line 9). Nowhere does the Hajnal reference describe a method that combines a central portion of all sub images to form the composite image as recited in claims 9 and 18 of Applicants' invention.

The Pelc reference does not overcome the above cited limitations of Hajnal. Specifically, Pelc does not disclose generating an image by computing sub-images and combining the sub-images to form a composite image. Pelc merely discloses a method for acquiring magnetic signals when the object is continuously moving. The object is placed on a moving table, which is linearly translatable through the magnetic field, and the plurality of receiver coils are affixed to and move with the object through the field of the magnet (column 3, lines 13-16). Nowhere does Pelc teach, suggest or disclose constructing images by computing sub-images corresponding to the MR signals for each receiver and for the given field-of-view (FOV) at a plurality of incremented locations of the subject. Furthermore, the Pelc reference does not teach, suggest or disclose combining the sub-images to form a composite image of the volume of interest, the combining step including combining a central portion of each sub-image to form the composite image as recited in claims 9 and 18 of Applicants' present invention.

Thus, no reasonable combination Hajnal and Pelc would obtain Applicants' recited invention of an imaging an extended volume of interest which is larger than an imaging portion of a magnet within the MRI system and constructing images by computing sub-images corresponding to the MR signals for each receiver and for the given field-of-view (FOV) at a plurality of incremented locations of the subject and combining the sub-images to form a composite image of the volume of interest as recited in claims 9 and 18 of Applicants' present invention.

Further there is no motivation in Hajnal to combine it with Pelc. Hajnal describes a method and system to generate volumetric images of a restricted region, where the part of the patient to be image is translated through the good field of the magnet and a receiver coil is provided to apply pulses to restricted regions within the region of the good field (column 3, lines 42-63). On the other hand, Pelc discloses acquiring image data when the object is

in continuous motion. The object is placed on a moving table, which is linearly translatable through the magnetic field, and the plurality of receiver coils are affixed to and move with the object through the field of the magnet (column 3, lines 13-16). Neither Hajnal nor Pelc discloses constructing images by computing sub-images corresponding to the MR signals for each receiver and for the given field-of-view (FOV) at a plurality of incremented locations of the subject and combining the sub-images to form a composite image of the volume of interest. Therefore, Hajnal (either alone or in combination with Pelc) does not disclose, teach or suggest disclose Applicants' invention as cited in claims 9 and 18.

Obviousness cannot be established absent a teaching or suggestion in the prior art to produce the claimed invention. For a prima facie case of obviousness, the Examiner must set forth the differences in the claim over the applied references, set forth the proposed modification of the references, which would be necessary to arrive at the claimed subject matter, and explain why the proposed modification would be obvious. It is well-established law that the mere fact that references may be combined or modified does not render the resultant modification or combination obvious unless the prior art suggests the desirability of the modification or combination.

Therefore, the present invention, as claimed in independent claims 9 and 18 are patentable over the Hajnal reference in view of the Pelc reference. Claims 10-15, 17 and 32-35 depend directly or indirectly from claim 9, and claims 19-25 and 36-39. Accordingly, Applicant submits that claims 10-15, 17, 19-25 and 32-39 are allowable by dependency. Thus, it is respectfully requested that the rejection of claims 9-15, 17-26 and 32-39 under 35 USC §103(a) be withdrawn.

In view of the foregoing amendment and for the reasons set out above, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number below.

Respectfully submitted,



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Enclosures: Terminal Disclaimer & Replacement Drawing Sheet

Appl. No. 10/065,036
Amdt. Dated June 13, 2005
Reply to Office action of March 16, 2005

Amendment to the Drawings:

The attached sheet of drawing includes changes to Figure 4. This sheet replaces the original sheets including Fig. 4.

Attachment: Replacement Sheet